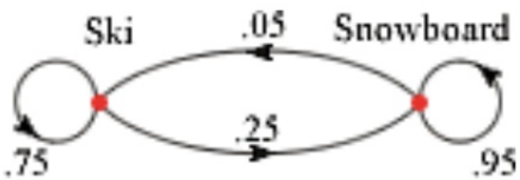
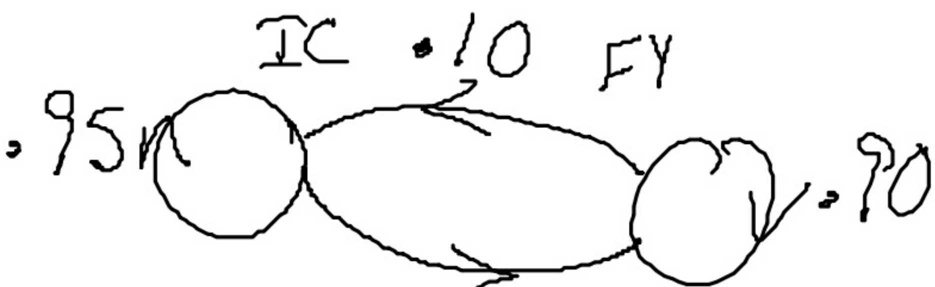
6.1 Matrix Representations

Transition diagram





Transition matrix

Tomorrow

Today	Ski	Snowboard
Ski	.75	.25
Snowboard	.05	.95

This entry shows that 5% of people who snowboard today will ski tomorrow.

Next wk.

this wk	IC	FY
IC	.95	.05
FY	.10	.90

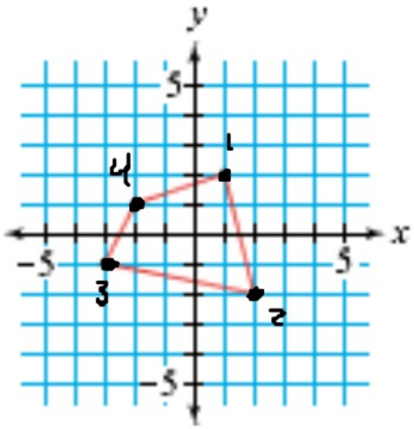
First week

IC	220
FY	20

Second Week

$220(.95)+20(.10)=211$

Ex. A



$$\begin{array}{c} x \\ y \end{array}\begin{bmatrix} 1 & 2 & -3 & -2 \\ 2 & -2 & -1 & 1 \end{bmatrix}$$

→ Rows

↓ columns

entry

dimensions = rows x columns

2x4 matrix

1x3 $\begin{bmatrix} a & b & c \end{bmatrix}$

3x1 $\begin{bmatrix} a \\ b \\ c \end{bmatrix}$

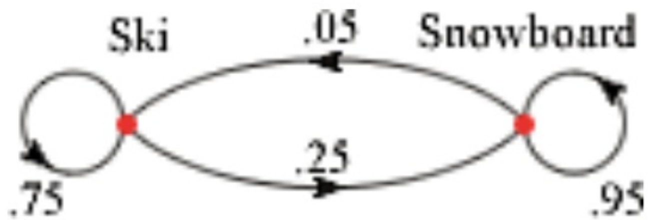
entry 1, 2 = 2

entry 2, 3 = -1

entry row, column

1 = entry 2, 4

Ex. B



Day 1: 260 skiers
40 Snowboarders

Tomorrow

$$\begin{array}{ccc} & SK & Sn \\ \text{Today } SK & .75 & .25 \\ Sn & .05 & .95 \end{array}$$

Day 2:

$$\begin{array}{r} 260 \; SK \\ \times .75 \\ \hline 195 \end{array} \qquad \begin{array}{r} 40 \; SN \\ \times .05 \; SK \\ \hline 2 \end{array}$$

$$\begin{array}{r} 260 \\ -195 \\ \hline 65 \end{array} \qquad \begin{array}{r} 40 \\ -2 \\ \hline 38 \end{array}$$

197 Ski
103 Snowboarders

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#1-4, 11

2)

3)

$$\begin{array}{c|cc} & Sk & Sn \\ \hline Sk & .60 & .40 \\ Sn & .53 & .47 \end{array} \quad \begin{array}{l} = 1.00 \\ = 1.00 \end{array}$$

$$\begin{bmatrix} 1,1 & 1,2 \\ 2,1 & 2,2 \end{bmatrix}$$

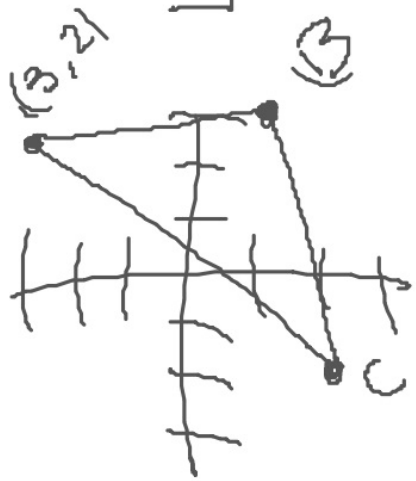
4)

$$\begin{array}{c|ccc} & A & B & C \\ \hline X & -3 & 1 & 2 \\ Y & 2 & 3 & -2 \end{array}$$

A $(-3, 2)$

B $(1, 3)$

C $(2, -2)$

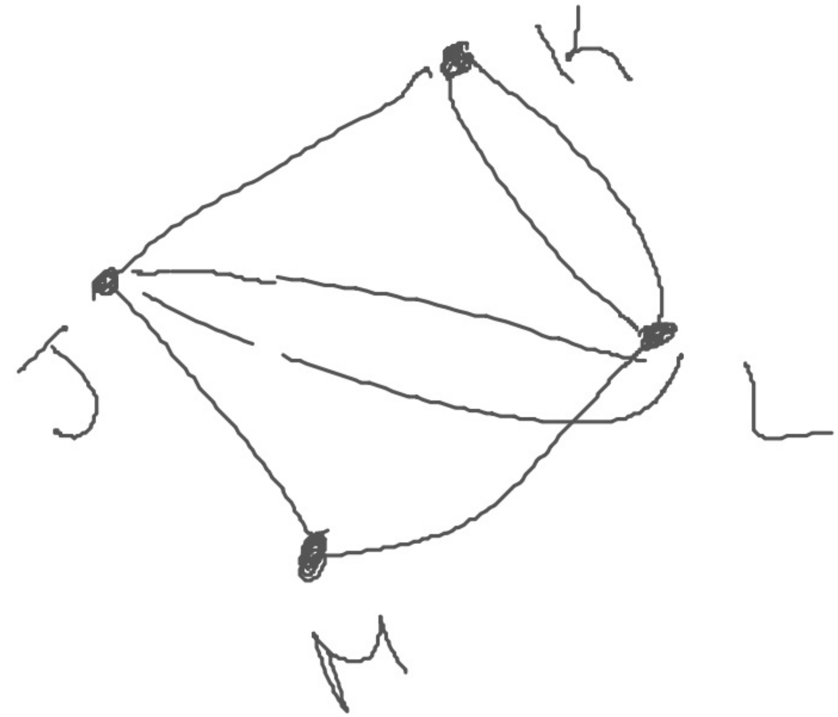


A' $(-3, -2)$ A'' $(1, 2)$

B' $(1, -1)$ B'' $(5, 3)$

C' $(2, -6)$ C'' $(6, -2)$

$$\begin{array}{ccc} \begin{matrix} J \\ K \\ L \\ M \end{matrix} & \begin{bmatrix} 0 & 1 & 2 & 1 \\ 1 & 0 & 2 & 0 \\ 2 & 2 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix} & \begin{matrix} \\ = 3 \\ 5 \\ \\ \end{matrix} \\ & \begin{matrix} J & K & L & M \end{matrix} & \end{array}$$



$$[A] = \begin{bmatrix} 86 & 33 \\ 65 & 20 \\ 78 & 50 \end{bmatrix} \qquad [B] = \begin{bmatrix} 80 & 25 \\ 65 & 15 \\ 105 & 55 \end{bmatrix}$$

$$[A]+[B] = \begin{bmatrix} 166 & 58 \\ 130 & 35 \\ 203 & 105 \end{bmatrix}$$

$$[C] = \begin{bmatrix} 12 & 69 \\ 52 & 82 \\ 71 & 71 \end{bmatrix} \quad [D] = \begin{bmatrix} 72 \\ 15 \\ 6 \end{bmatrix}$$

Cannot be added

$$\begin{bmatrix} & , & , & \\ & , & , & \end{bmatrix}$$

3×2

1×3 $\quad$ 3×1

2×3

$$\begin{bmatrix} & , & 0 \\ & , & 6 \\ & , & 0 \end{bmatrix}$$

$[A] + [13]$

Ex A $\begin{bmatrix} -3 & 1 & 2 \\ 2 & 3 & -2 \end{bmatrix}$ left 3 units $\begin{bmatrix} -6 & -2 & -1 \\ 2 & 3 & -2 \end{bmatrix}$

$+\begin{bmatrix} -3 & -3 & -3 \\ 0 & 0 & 0 \end{bmatrix} =$

trans.

$\longrightarrow +^{+}$ $\quad \uparrow +^{+}$ $\quad \downarrow +^{-}$

$\longleftarrow +^{-}$

b) $\begin{bmatrix} -3 & 1 & 2 \\ 2 & 3 & -2 \end{bmatrix} + \begin{bmatrix} -4 & -4 & -4 \\ -3 & -3 & -3 \end{bmatrix} = \begin{bmatrix} -7 & -3 & -2 \\ -1 & 0 & -5 \end{bmatrix}$

Δ

down 3
left 4

c) $\frac{1}{2} \cdot \begin{bmatrix} -3 & 1 & 2 \\ 2 & 3 & -2 \end{bmatrix} = \begin{bmatrix} -6 & 2 & 4 \\ 4 & 6 & -4 \end{bmatrix}$

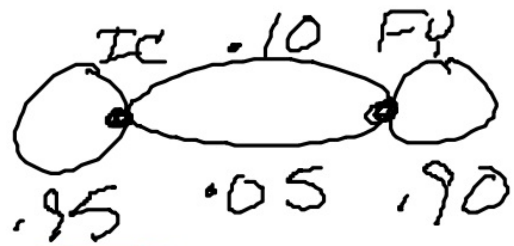
dilation

$\circ \longrightarrow O$

Constriction

$O \longrightarrow \circ$

Ex B



$$\begin{array}{cc} IC & Fy \end{array} \quad \begin{array}{c} \\ IC \\ Fy \end{array} \begin{array}{cc} IC & Fy \\ & \end{array} \qquad \begin{array}{cc} IC & FY \end{array}$$

$$\begin{bmatrix} 200 & 20 \end{bmatrix} \begin{bmatrix} .95 & .05 \\ .10 & .90 \end{bmatrix} = \begin{bmatrix} 192 & 28 \end{bmatrix}$$

1×2 $\quad$ 2×2 $\quad$ 1×2

$$\begin{bmatrix} 200 \times .95 & 200 \times .05 \\ + \; 20 \times .10 & 20 \times .90 \end{bmatrix}$$

$$\begin{bmatrix} 192 & 28 \end{bmatrix}$$

Multiply

Columns = rows

2×2	1×2
2×2	2×3
2×2	3×3
2×3	1×2
2×3	3×1

Ex C $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} -3 & 1 & 2 \\ 2 & 3 & -2 \end{bmatrix} = \begin{bmatrix} 3 & -1 & -2 \\ 2 & 3 & -2 \end{bmatrix}$

$2 \times 2 \quad 2 \times 3 \quad 2 \times 3$

must match

$1 \times 2 \quad 2 \times 2$

$$\begin{bmatrix} \begin{array}{r} -1\cdot -3 \\ +0\cdot -3 \\ \hline 3 \end{array} & \begin{array}{r} -1\cdot 1 \\ +0\cdot 1 \\ \hline -1 \end{array} & \begin{array}{r} -1\cdot 2 \\ +0\cdot 2 \\ \hline -2 \end{array} \\ \\ \begin{array}{r} 2\cdot 0 \\ +1\cdot 2 \\ \hline 2 \end{array} & \begin{array}{r} 3\cdot 0 \\ +1\cdot 3 \\ \hline 3 \end{array} & \begin{array}{r} -2\cdot 0 \\ +1\cdot -2 \\ \hline -2 \end{array} \end{bmatrix}$$

8) $[A] = \begin{bmatrix} 2 & 3 \\ -1 & 1 \end{bmatrix}$ $[B] = \begin{bmatrix} 3 & 4 \\ 0 & -2 \end{bmatrix}$ $[C] = \begin{bmatrix} -2 & 3 & 0 \\ -1 & 5 & 4 \end{bmatrix}$ $[D] = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ 4/26

a) $[A][B] = \begin{bmatrix} 6 & 2 \\ -3 & -6 \end{bmatrix}$

$[B][A] = \begin{bmatrix} 2 & 13 \\ 2 & -2 \end{bmatrix}$

b) $[A][C] = \begin{bmatrix} -7 & 21 & 12 \\ 1 & 2 & 4 \end{bmatrix}$ $2\times3 \quad 2\times2$

$[C][A] =$ Dimension Mismatch

8 $[A] = \begin{bmatrix} 2 & 3 \\ -1 & 1 \end{bmatrix}$ $[B] = \begin{bmatrix} 3 & 4 \\ 0 & -2 \end{bmatrix}$ $[C] = \begin{bmatrix} -2 & 3 & 0 \\ -1 & 5 & 4 \end{bmatrix}$ $[D] = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

c) $[A][D] = \begin{bmatrix} 2 & 3 \\ -1 & 1 \end{bmatrix} = [A]$

$[D][A] = \begin{bmatrix} 2 & 3 \\ -1 & 1 \end{bmatrix} = [A]$

Multiplication Identity = $\underbrace{1}$

Identity Matrix $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

en echelon

Matrix Addition pp. 313-314 #1-4

- Must be the same size
- add corresponding entries (eg. 1,1 + 1,1)

Scalar Multiplication

Multiply the number by every entry

Matrix Multiplication

- Columns from first matrix must match rows from second matrix

$$\left(\text{eg. } 1 \times \overset{C}{2} \quad \overset{R}{2} \times 2\right) \quad \begin{bmatrix} 1,1 & 1,2 \end{bmatrix} \begin{bmatrix} 1,1 & 1,2 \\ 2,1 & 2,2 \end{bmatrix}$$

- multiply 1,1 + 1,2 from first by 1,1 + 2,1 from 2ND
- Sum the corresponding entries
- Continue across second matrix

4 $\begin{bmatrix} 8 & -5 & 4.5 \\ -6 & 9.5 & 5 \end{bmatrix} - [B] = \begin{bmatrix} 5 & -1 & 2 \\ -4 & 3.5 & 1 \end{bmatrix}$

$\underline{2} \times \underline{\quad 3}$

$$\begin{bmatrix} \underline{3} & \underline{-4} & \underline{2.5} \\ \underline{\quad} & \underline{\quad} & \underline{\quad} \end{bmatrix}$$

- A system of equations that has at least one solution is called **consistent.**
- A system of equations that has no solutions is called **inconsistent.**
- A system with infinitely many solutions is called **dependent.**
- A system of equations that has exactly one solution is called **independent.**

augment – to add to

$$2x + y = 5$$
$$5x + 3y = 13$$

$$\begin{array}{cc} & \begin{array}{ccc} x & y & \text{answer} \end{array} \\ 3x & \left[\begin{array}{cc|c} 2 & 1 & 5 \\ 5 & 3 & 13 \end{array}\right] \end{array}$$

$$\left[\begin{array}{cc|c} 6 & 3 & 15 \\ 5 & 3 & 13 \end{array}\right] \quad R_1 - R_2$$

$$\left[\begin{array}{cc|c} 1 & 0 & 2 \\ 5 & 3 & 13 \end{array}\right] \quad R_2 - 5 \cdot R_1$$

$$\left[\begin{array}{cc|c} 1 & 0 & 2 \\ 0 & 3 & 3 \end{array}\right] \div 3$$

$$\begin{array}{ccc} x & y & \text{answer} \end{array}$$
$$\left[\begin{array}{cc|c} 1 & 0 & 2 \\ 0 & 1 & 1 \end{array}\right]$$

$$x = 2 \qquad (2, 1)$$
$$y = 1$$

$$\begin{array}{cc} x & y \end{array}$$
$$\left[\begin{array}{cc|c} 0 & 1 & 1 \\ 1 & 0 & 2 \end{array}\right]$$

$$(2x + y = 5) \times 3$$
$$5x + 3y = 13$$
$$6x + 3y = 15$$
$$-\ 5x + 3y = 13$$
$$1x + 0y = 2$$

$$\left[\begin{array}{cc|c} 1 & 0 & 2 \end{array}\right]$$

$$2(2) + y = 5$$
$$4 + y = 5$$
$$y = 1$$

$$\begin{array}{c} 5x \\ 2x \end{array}\left[\begin{array}{cc|c} 2 & 1 & 5 \\ 5 & 3 & 13 \end{array}\right]$$

$$\begin{array}{c} \\ R_2 - R_1 \end{array}\left[\begin{array}{cc|c} 10 & 5 & 25 \\ 10 & 6 & 26 \end{array}\right]$$

$$R_1 - 5R_2 \left[\begin{array}{cc|c} 10 & 5 & 25 \\ 0 & 1 & 1 \end{array}\right]$$

$$\div 10 \left[\begin{array}{cc|c} 10 & 0 & 20 \\ 0 & 1 & 1 \end{array}\right]$$

$$\left[\begin{array}{cc|c} 1 & 0 & 2 \\ 0 & 1 & 1 \end{array}\right]$$

$$7x + 2y = 11$$
$$3x - 5y = 120$$

$$2.5\times\left[\begin{array}{cc|c} 7 & 2 & 11 \\ 3 & -5 & 120 \end{array}\right]$$

$$\left[\begin{array}{cc|c} 17.5 & 5 & 27.5 \\ 3 & -5 & 120 \end{array}\right] R_1 + R_2$$

$$\left[\begin{array}{cc|c} 17.5 & 5 & 27.5 \\ 20.5 & 0 & 147.5 \end{array}\right] \cancel{R_1 - R_2}$$

$$\div 20.5$$

$$\left[\begin{array}{cc|c} -3.5 & 5 & -120 \\ 20.5 & 0 & 147.5 \end{array}\right] \div -3.5$$

$$\left[\begin{array}{cc|c} 1 & -1.428 & 34.29 \\ 20.5 & 0 & 147.5 \end{array}\right]$$

$$\left[\begin{array}{cc|c} 17.5 & 5 & 27.5 \\ 1 & 0 & 7.2 \end{array}\right]$$

$$R_1 - 17.5R_2 \qquad 5/2$$

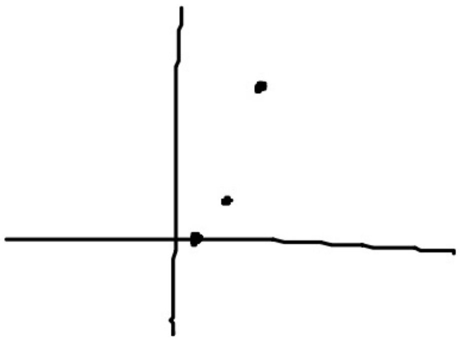
$$\left[\begin{array}{cc|c} 0 & 5 & -98.5 \\ 1 & 0 & 7.2 \end{array}\right]$$

$$\left[\begin{array}{cc|c} 0 & 5 & -98.5 \\ 1 & 0 & 7.2 \end{array}\right] R_1 \div 5$$

$$\left[\begin{array}{cc|c} 0 & 1 & -19.7 \\ 1 & 0 & 7.2 \end{array}\right]$$

$$(7.2, -19.7)$$

Inv.



looks like x^2

$$ax^2 + bx + c = y$$

$R_3 - R_2$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 0 \\ 16 & 4 & 1 & 12 \\ 36 & 6 & 1 & 30 \end{array}\right]$$

$R_3 \div 2$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 0 \\ 16 & 4 & 1 & 12 \\ 20 & 2 & 0 & 18 \end{array}\right]$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 0 \\ 16 & 4 & 1 & 12 \\ 10 & 1 & 0 & 9 \end{array}\right] R_2 - R_1$$

$R_3 - R_2$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 0 \\ 15 & 3 & 0 & 12 \\ 10 & 1 & 0 & 9 \end{array}\right] R_2/3 \left[\begin{array}{ccc|c} 1 & 1 & 1 & 0 \\ 5 & 1 & 0 & 4 \\ 10 & 1 & 0 & 9 \end{array}\right]$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 0 \\ 5 & 1 & 0 & 4 \\ 5 & 0 & 0 & 5 \end{array}\right] \quad R_2 - R_3$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & -1 \\ 5 & 0 & 0 & 5 \end{array}\right] \quad R_3/5$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & -1 \\ 1 & 0 & 0 & 1 \end{array}\right] \quad R_1 - R_3$$

$$\left[\begin{array}{ccc|c} 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & -1 \\ 1 & 0 & 0 & 1 \end{array}\right]$$

$$R_1 - R_2 \quad \left[\begin{array}{ccc|c} 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & -1 \\ 1 & 0 & 0 & 1 \end{array}\right]$$

$$1x^2 - 1x + 0 = y$$

Ex B 50 receipts 3 book titles

✓ \$14.00 x \$18.50 y \$23.25 c

✓ Total = \$909.00

✓ 22 more of \$18.50 sold than \$23.25

How many of each sold?

$$y - c = 22$$

$$14x + 18.5y + 23.25c = 909$$

$$x + y + c = 50$$

$$
\begin{array}{cccc}
x & y & c & \\
\end{array}
$$

$$
\left[\begin{array}{ccc|c}
0 & 1 & -1 & 22 \\
14 & 18.5 & 23.25 & 909 \\
1 & 1 & 1 & 50
\end{array}\right]
$$

$$\left[\begin{array}{ccc|c} 0 & 1 & -1 & 22 \\ 14 & 18.5 & 23.25 & 909 \\ 1 & 1 & 1 & 50 \end{array}\right]$$

$R_2 - 14R_3$

$$\left[\begin{array}{ccc|c} 0 & 1 & -1 & 22 \\ 0 & 4.5 & 9.25 & 209 \\ 1 & 1 & 1 & 50 \end{array}\right]$$

$R_3 - R_1$

$$\left[\begin{array}{ccc|c} 0 & 1 & -1 & 22 \\ 0 & 4.5 & 9.25 & 209 \\ 1 & 0 & 2 & 28 \end{array}\right]$$

$R_2 \div 4.5$

$$\left[\begin{array}{ccc|c} 0 & 1 & -1 & 22 \\ 0 & 1 & 2.06 & 46.4 \\ 1 & 0 & 2 & 28 \end{array}\right] \quad \left[\begin{array}{ccc|c} 0 & 1 & -1 & 22 \\ 0 & 0 & 1 & 7.97 \\ 1 & 0 & 2 & 28 \end{array}\right]$$

$R_2 - R_1$ $\qquad$ $R_2 + R_1$

$$\left[\begin{array}{ccc|c} 0 & 1 & -1 & 22 \\ 0 & 0 & 3.56 & 24.4 \\ 1 & 0 & 2 & 28 \end{array}\right] \quad \left[\begin{array}{ccc|c} 0 & 1 & 0 & 29.97 \\ 0 & 0 & 1 & 7.97 \\ 1 & 0 & 2 & 28 \end{array}\right]$$

$R_2/3.6$ $\qquad$ $R_3 - 2R_2$

$$\left[\begin{array}{ccc|c} 0 & 1 & 0 & 29.97 \\ 0 & 0 & 1 & 7.97 \\ 1 & 0 & 0 & 12.06 \end{array}\right]$$

X = 12
Y = 30
C = 8
56

32
2

12 × 14

8 + 30 18.5

I ♥ Jennifer

pp. 323-324
#1-5

$\underline{1} \times 3 \cdot 3 \times \underline{2}$

1×2 answer size

$$\begin{bmatrix} a & b \\ c & d \\ +e & +f \end{bmatrix}$$

$$\begin{bmatrix} g & h \end{bmatrix}$$

$\underline{4} \times 3 \quad 3 \times \underline{2}$

4×2

$a \times \frac{1}{a} = 1$ Inverse

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

$[A]$ $[A]^{-1} = 1 = [A]^{-1}[A]$

Identity

$r \times c \quad r \times c$ $r = c$

square

$a \times 1 = a$

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix} \begin{bmatrix} 3 & 2 \\ 4 & 1 \end{bmatrix} = \begin{bmatrix} 3 & 2 \\ 4 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix} \begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix}$$

Identity

$\underline{2} \times 2 \quad 2 \times \underline{2}$

$$\begin{bmatrix} 2a+1c & 2b+1d \\ 4a+3c & 4b+3d \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix}$$

$2a+c=2 \quad 2b+d=1$

$4a+3c=4 \quad 4b+3d=3$

$$(2a + c = 2) \times 2$$
$$4a + 3c = 4$$
$$-(4a + 2c = 4)$$
$$0a \quad 1c = 0$$
$$c = 0$$
$$4a + 3(0) = 4$$
$$4a = 4$$
$$a = 1$$

$$(2b + d = 1) \times 2$$
$$4b + 3d = 3$$
$$-(4b + 2d = 2)$$
$$0b + 1d = 1$$
$$d = 1$$
$$2b + 1 = 1$$
$$ - 1 \quad -1$$
$$\frac{2b}{2} = \frac{0}{2}$$
$$b = 0$$

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \text{ r.r.e.m.}$$

Identity Matrix

$[I][A] = [A][I] = [A]$

$[I] =$ Same dim. as $[A]$
reduced row echelon matrix $\begin{bmatrix} 1 & & \\ & 1 & \\ & & 1 \end{bmatrix}$

$$\underset{[A]}{\begin{bmatrix} 1 & 6 & 14 \\ 4 & 9 & 3 \\ 8 & 12 & 0 \end{bmatrix}} \times \underset{[I]}{\begin{bmatrix} \underline{1} & \underline{0} & \underline{0} \\ \underline{0} & \underline{1} & \underline{0} \\ \underline{0} & \underline{0} & \underline{1} \end{bmatrix}} = \underset{[A]}{\begin{bmatrix} 1 & 6 & 14 \\ 4 & 9 & 3 \\ 8 & 12 & 0 \end{bmatrix}}$$

Inverse Matrix

$$[A][A]^{-1} = [A]^{-1}[A] = [I]$$

$[A]^{-1}$ Same dim. as $[A]$

$$\overset{[A]}{\begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix}} \overset{[A]^{-1}}{\begin{bmatrix} a & b \\ c & d \end{bmatrix}} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$2a + 1c = 1$ $\qquad$ $2b + 1d = 0$

$4a + 3c = 0$ $\qquad$ $4b + 3d = 1$

$(2a + 1c = 1) \times 2$

$4a + 3c = 0$

$-(4a + 2c = 2)$

$0a \quad 1c = -2$

$c = -2$

$2a + 1(-2) = 1$

$2a - 2 = 1$

$+2 \quad +2$

$\frac{2a}{2} = \frac{3}{2}$

$a = \frac{3}{2} = 1.5$

$(2b + 1d = 0) \times 2$

$4b + 3d = 1$

$-(4b + 2d = 0)$

$0b + \frac{\cancel{1}d}{\cancel{1}} = \frac{1}{1}$

$d = 1$

$2b + 1(1) = 0$

$2b + \cancel{1} = 0$

$\cancel{-1} \quad -1$

$\frac{\cancel{2}b}{\cancel{2}} = \frac{-1}{2}$

$b = -0.5$

$$\begin{bmatrix} 1.5 & -0.5 \\ -2 & 1 \end{bmatrix}$$

$$\underset{[A]}{\begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix}} \underset{[A]^{-1}}{\begin{bmatrix} 1.5 & -0.5 \\ -2 & 1 \end{bmatrix}} \Rightarrow \underset{[I]}{\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}}$$

Solving a system using an inverse matrix

$$[A][X] = [B]$$

$$[A]^{-1}[A][X] = [A]^{-1}[B]$$

$$[I][X] = [A]^{-1}[B]$$

$$[X] = [A]^{-1}[B]$$

$[A] \Rightarrow [A]^{-1}$

$$2x + 3y = 7$$

$$x = 6 - 4y$$

$$+4y \qquad +4x$$

$$x + 4y = 6$$

$$\underset{\underline{2}\times 2}{\overset{[A]}{\begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}}} \underset{2\times \underline{1}}{\overset{[x]}{\begin{bmatrix} x \\ y \end{bmatrix}}} = \underset{2\times 1}{\overset{[B]}{\begin{bmatrix} 7 \\ 6 \end{bmatrix}}} \qquad \overset{[A]^{-1}}{\begin{bmatrix} 0.8 & -0.6 \\ -0.2 & 0.4 \end{bmatrix}}$$

$$[A]^{-1}[B] = \begin{bmatrix} 2 \\ 1 \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$$

$$[A]^{-1}[A][x] = [I][x] = [x]$$

$$2c + 1d + 2p = 11.85$$
$$1c + 2d + 1p = 9.00$$
$$2d + 3p = 12.35$$

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$$\underset{3\times 3}{\overset{[A]}{\begin{bmatrix} 2 & 1 & 2 \\ 1 & 2 & 1 \\ 0 & 2 & 3 \end{bmatrix}}} \underset{3\times 1}{\overset{[X]}{\begin{bmatrix} c \\ d \\ p \end{bmatrix}}} = \underset{3\times 1}{\overset{[B]}{\begin{bmatrix} 11.85 \\ 9.00 \\ 12.35 \end{bmatrix}}}$$

WRONG

$$[A]^{-1}[B] = \underset{3\times 1}{\boxed{\begin{bmatrix} 3.7214 \\ 0.8714 \\ 3.5357 \end{bmatrix}}} \quad \underset{3\times 1}{\begin{bmatrix} 2.15 \\ 2.05 \\ 2.75 \end{bmatrix}} \checkmark$$

4a) $\begin{bmatrix} 5 & 2 \\ 7 & 3 \end{bmatrix} \begin{bmatrix} 3 & -2 \\ -7 & 5 \end{bmatrix}$

$\begin{matrix} 15 & -10 \\ -14 & 10 \\ 21 & -14 \\ -21 & 15 \end{matrix}$

$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

yes

5d) $\begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$

$[A]^{-1}$ Does not exist

X^{-1}

$1x + 2y$

$2x + 4y$

Same line

6a) $8x + 3y = 41$

$6x + 5y = 39$

$$\underset{[A]}{\begin{bmatrix} 8 & 3 \\ 6 & 5 \end{bmatrix}} \underset{[X]}{\begin{bmatrix} x \\ y \end{bmatrix}} = \underset{[B]}{\begin{bmatrix} 41 \\ 39 \end{bmatrix}}$$

$[X] = [A]^{-1}[B]$

$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ 3 \end{bmatrix}$

"$[A]^{-1} = \left[\quad\right]$ from calculator"

<u>is</u> acceptable.

Augmented

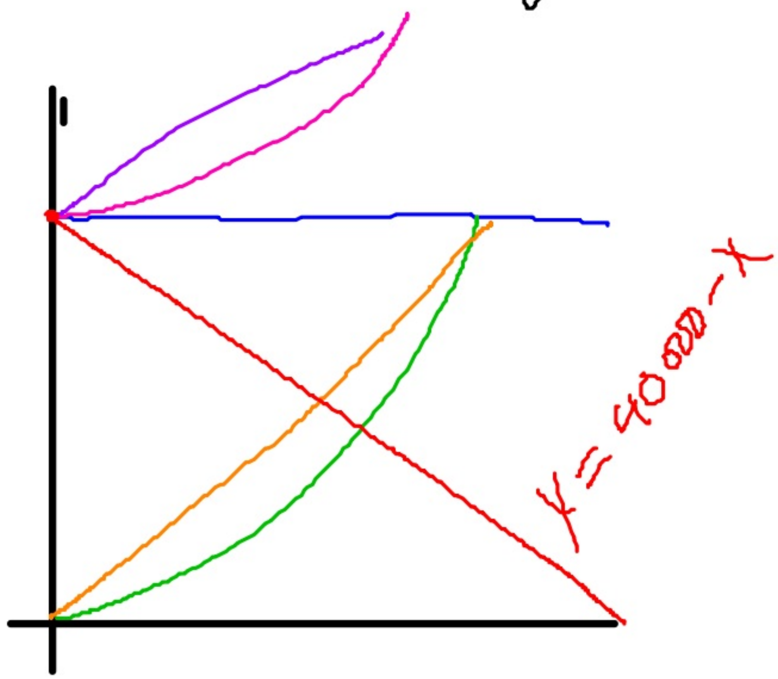
$$\left[\quad\middle|\quad\right] \Rightarrow \overset{[A]}{\left[\quad\right]}\overset{[x]}{\left[\quad\right]} = \overset{[B]}{\left[\quad\right]}$$

$5 \cdot \$3 + N \cdot \$5 = \$1535$

$N = -70 + 25$

inequality = not equal

linear = straight line

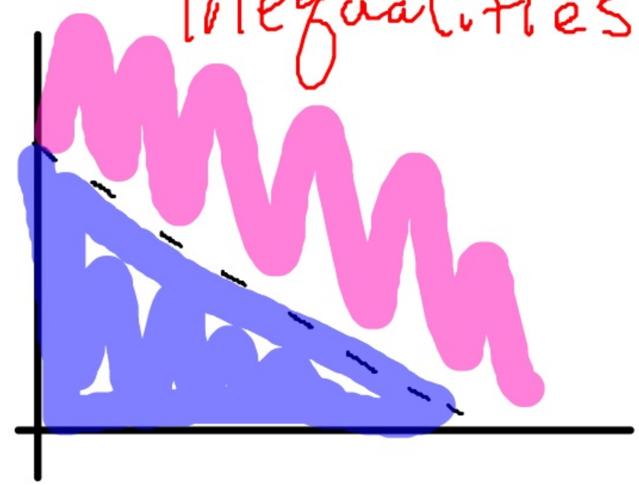


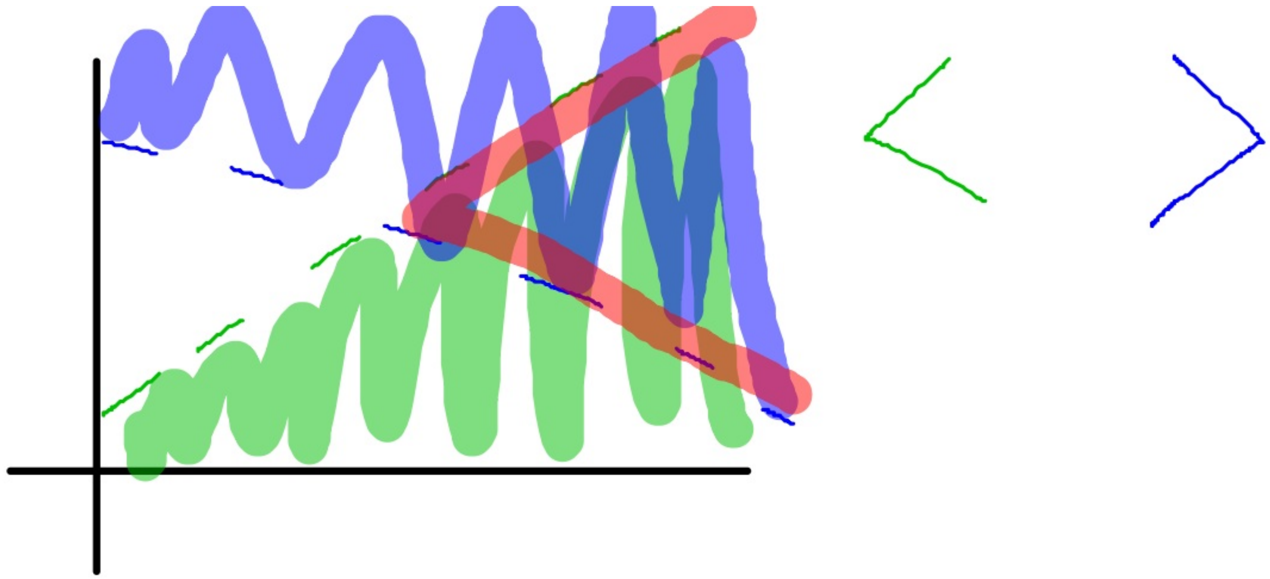
$X + y = 40,000$

$y = 40000 - X$

$< \quad > \quad \leq \quad \geq$

inequalities



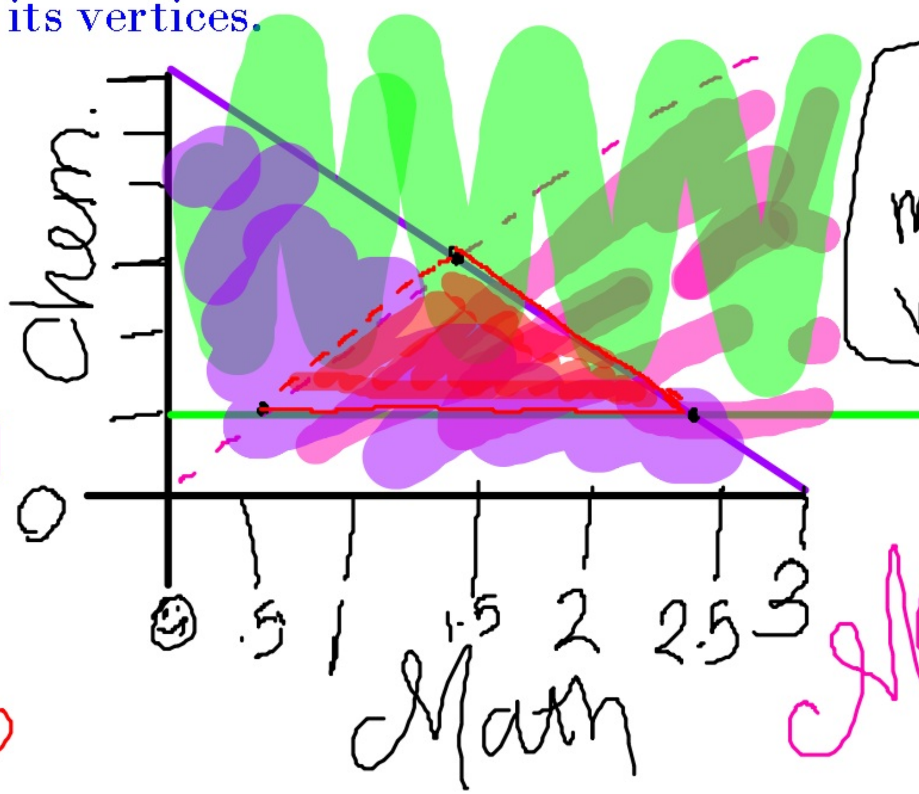


Rachel has 3 hours to work on her homework tonight. She wants to spend more time working on mathematics than on chemistry, and she must spend at least a half hour working on chemistry. State the constraints of this system algebraically with x representing mathematics time in hours and y representing chemistry time in hours. Graph your inequalities, shade the feasible region, and label its vertices. 5/13

$X > Y$

$0.5 \leq Y$

$3 \geq X + Y$



1 vertex more then 1 vertices

Homework★
Pg 339-340
#1,2,3,5

Monique

Inequalities are manipulated like equations EXCEPT when you multiply or divide by a NEGATIVE number. In those cases, the sign will flip from one direction to the other.

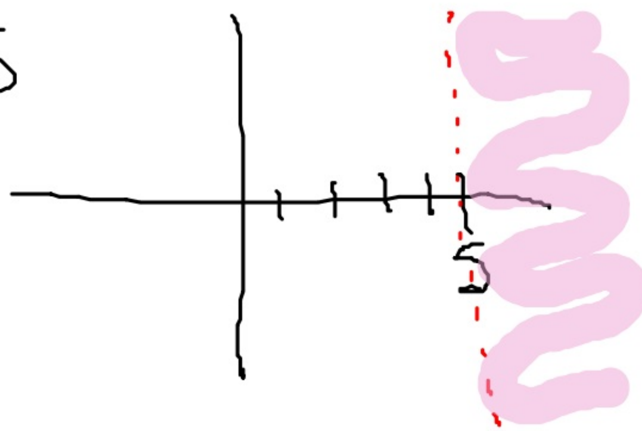
1 a) $2x - 5y > 10$

$-2x \qquad\qquad -2x$

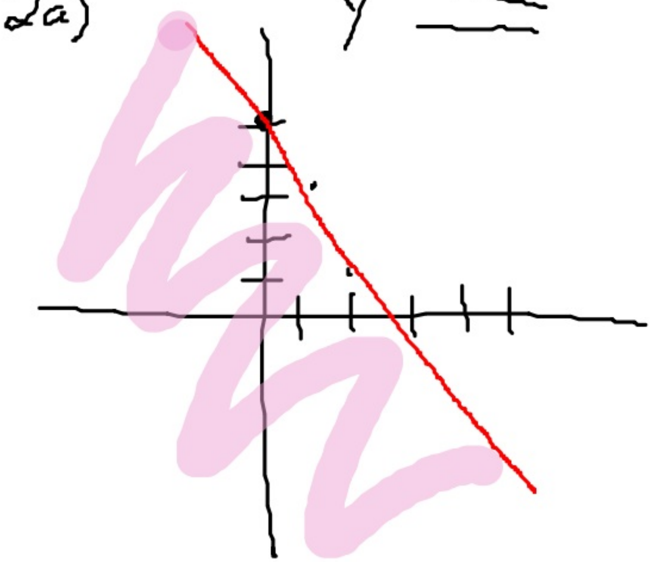
$$\frac{-5y}{-5} > \frac{10-2x}{-5}$$

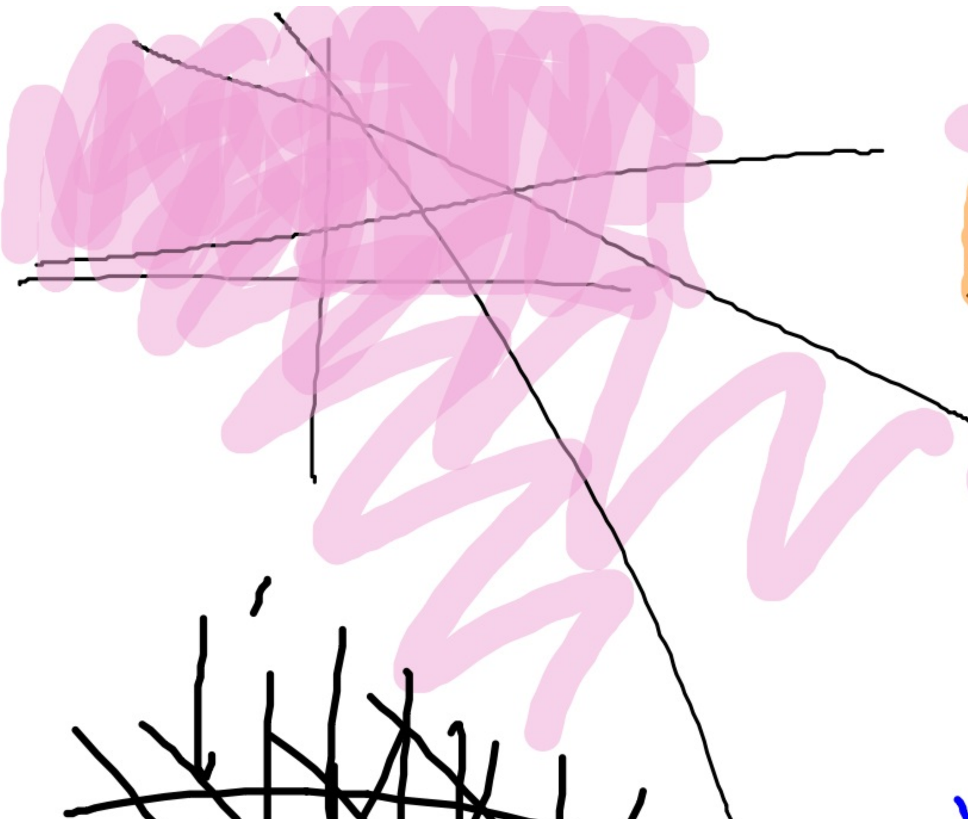
$$y < -2 + \frac{2}{5}x$$

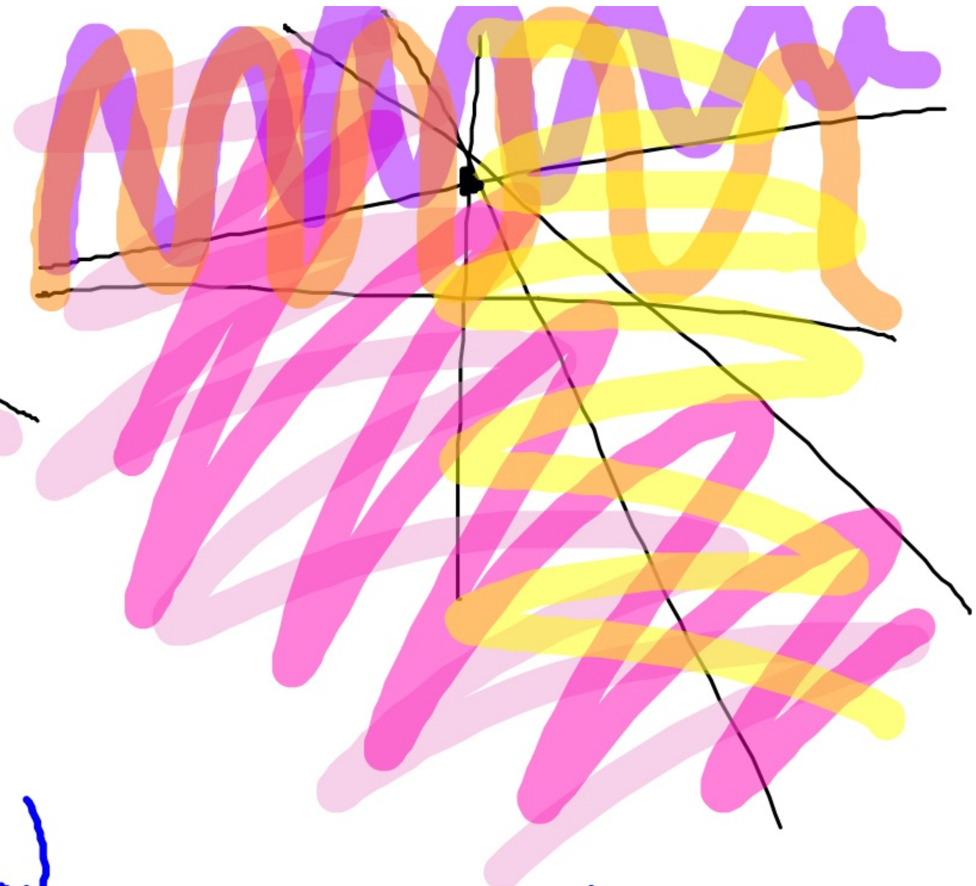
2c) $x > 5$

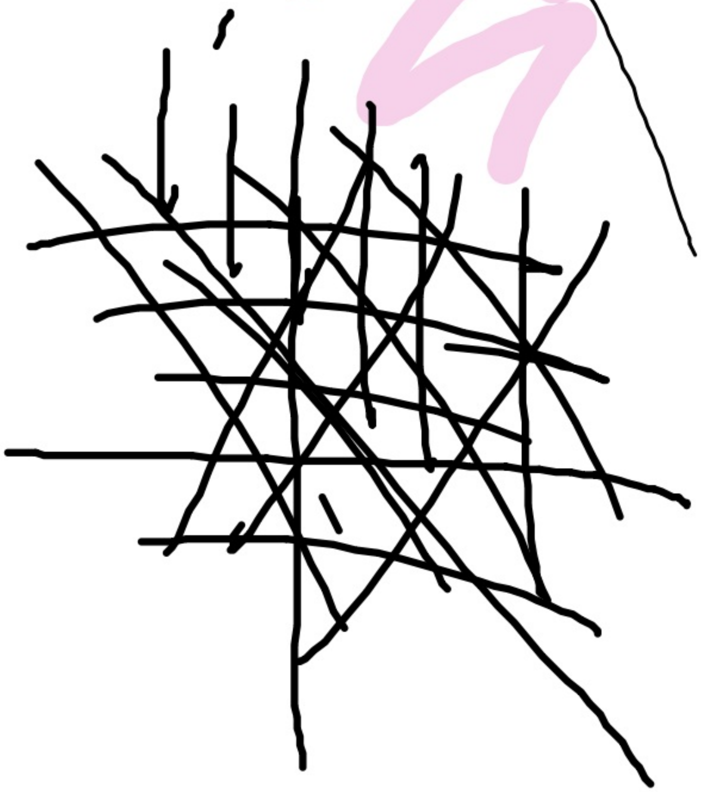


2a) $y \leq$









3a)

$$y < 2 - \frac{1}{2}x$$

$(0,2)\ (4,0)\ \frac{2}{4}$

linear programming - the process of finding a feasible region and determining the point that gives the maximum or minimum value to a specific expression

Considerations/Constraints

Kilns up to 60 h/d

pot. wheel up to 8 h/d

g up to 2 u 6 (18h)

g up to 5 u 6 (3h)

u unglazed min. 6 per day

Unglazed wheel 0.5 h

kiln 3 h

3.5 h ea

g glazed wheel 1 h

kiln 18 h

19 h ea

	kiln	Wheel	profit
glazed (g)	18	1	40
unglazed (u)	3	0.5	10
constraint	≤ 60	≤ 8	

$u = 14$
$g = 1$

$18g + 3u \leq 60$

$1g + 0.5u \leq 8$

$g \leq 8 - 0.5u$

$18(8 - 0.5u) + 3u \leq 60$

$144 - 9u + 3u \leq 60$

$144 - 6u \leq 60$

$-6u \leq -84$

$u \geq 14$

$g + 0.5(14) \leq 8$

$g + 7 \leq 8$

$g \leq 1$

18	+ 1
42	7
14	14

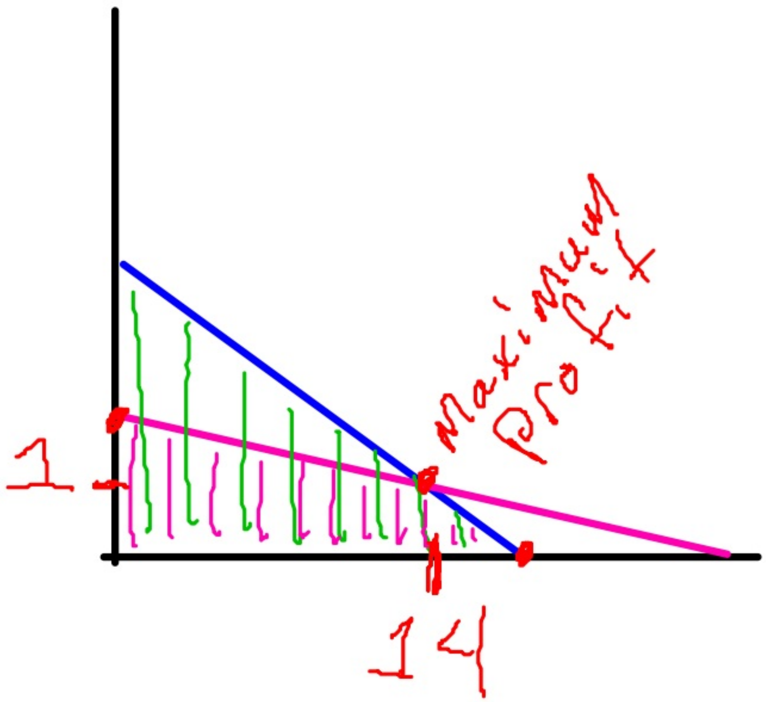
$$18g + 3u \le 60 \qquad g \le (60-3u)/18 = 3.33 - .167u$$

$$1g + 0.5u \le 8 \qquad g \le 8 - 0.5u$$

5/17

$u = 14$

$g = 1$



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#1–3

Chapter 6 Review p. 351 5/19

1, 2 a&c, 3-5, 7